

Thoughts on Tech Group Definitions for New Predictive Model

July 10, 2006

**AIR, Inc. for
Alliance of Automobile Manufacturers &
General Motors**

Principles

- Revisions to Predictive Model provide opportunity to review Tech group definitions and make changes, if appropriate
- Current Tech group definitions

Pre-1988: Tech group 3

1988-1995: Tech group 4

1996+: Tech group 5

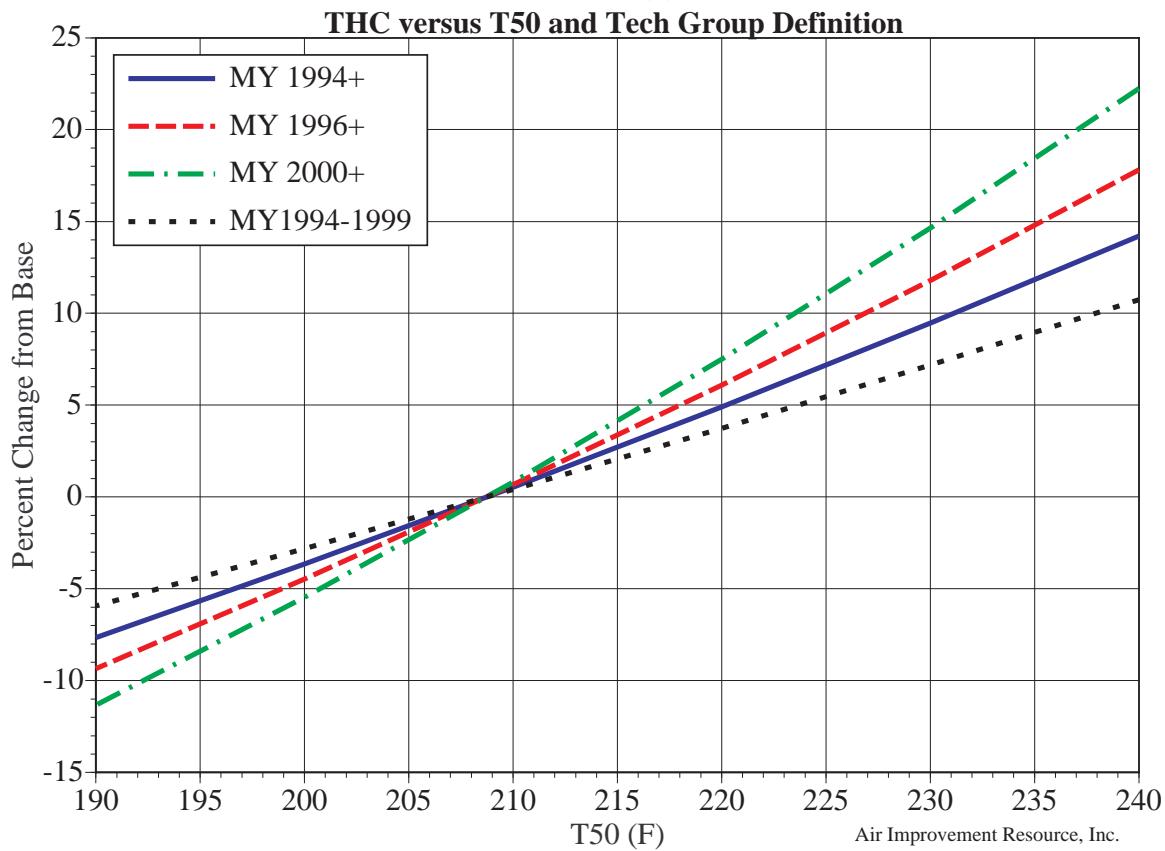
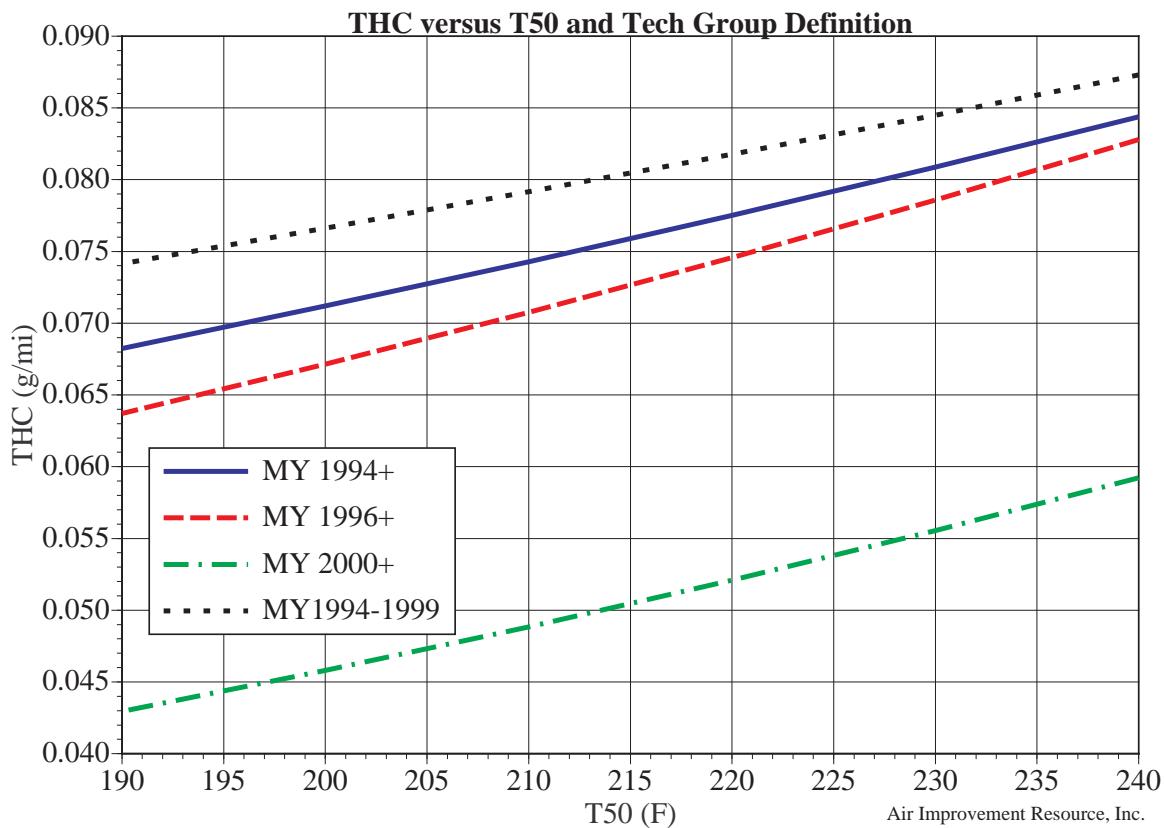
These are the “nominal” current groups.

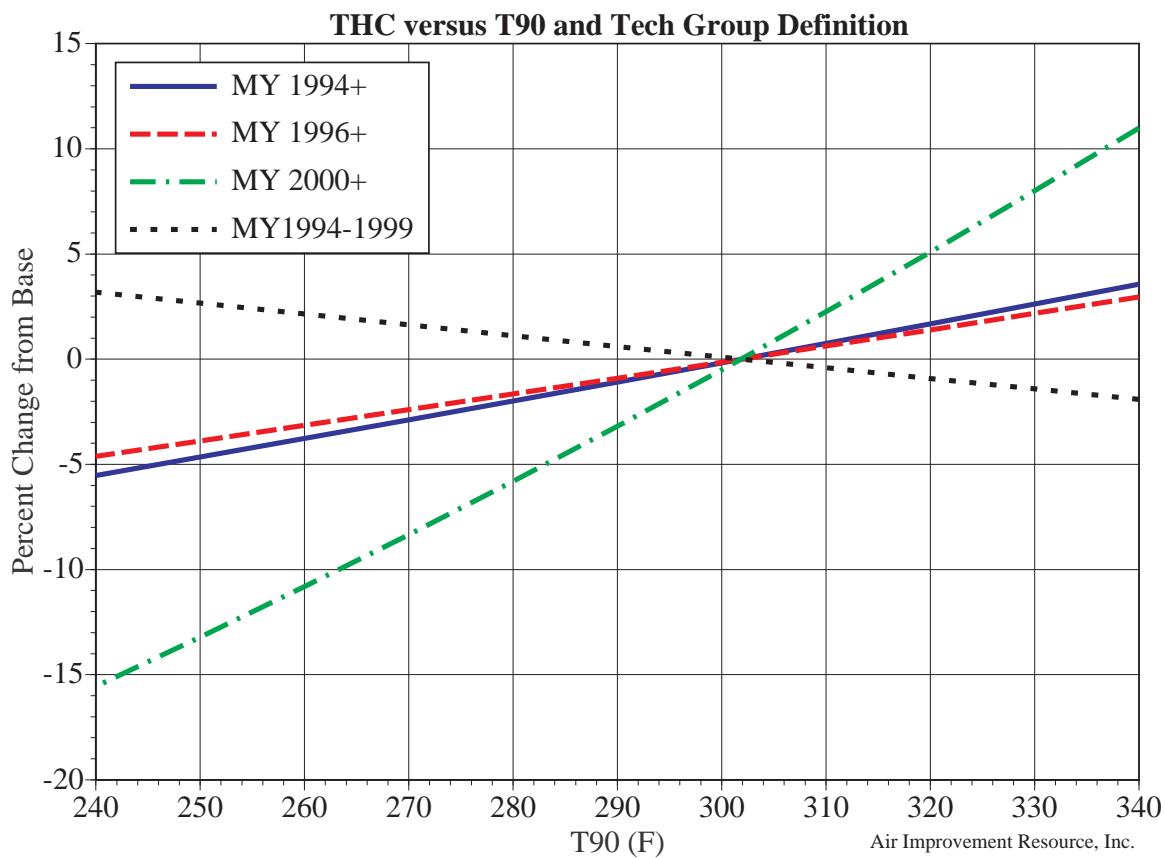
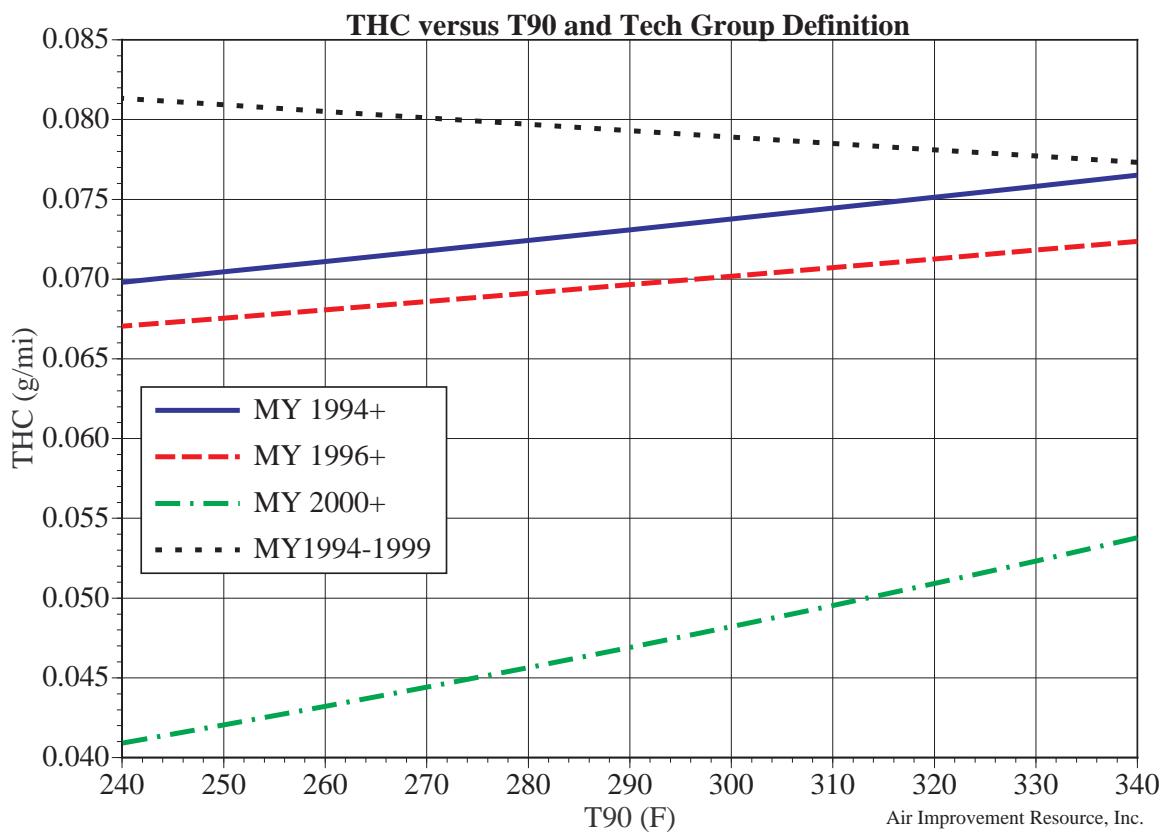
- Data on more recent model year vehicles has been added to fuels dataset
 - 1999, 2000, and 2001 vehicles
 - LEVs, ULEVs, SULEVs
 - (However, no “LEV2” vehicles yet with lower NOx, other than the PZEVs)
 - These vehicles have been tested primarily on varying levels of sulfur, oxygen, T50 and T90

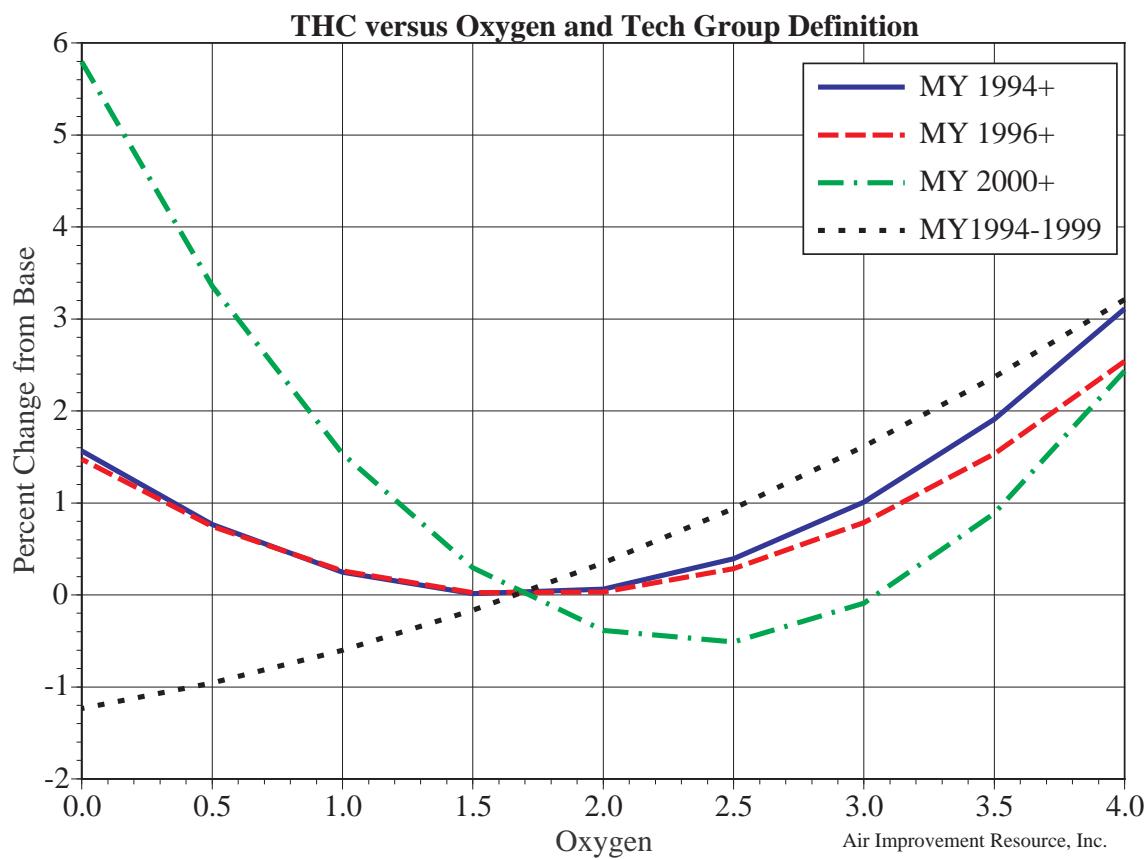
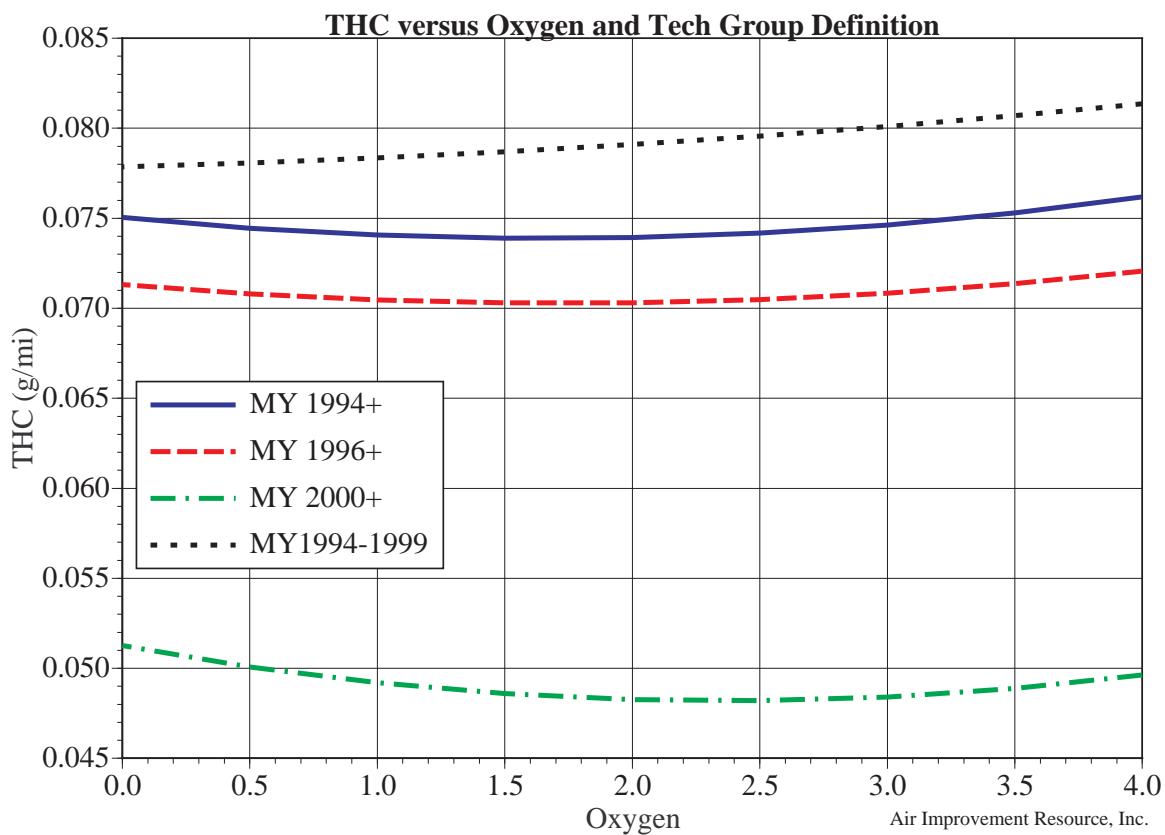
Method

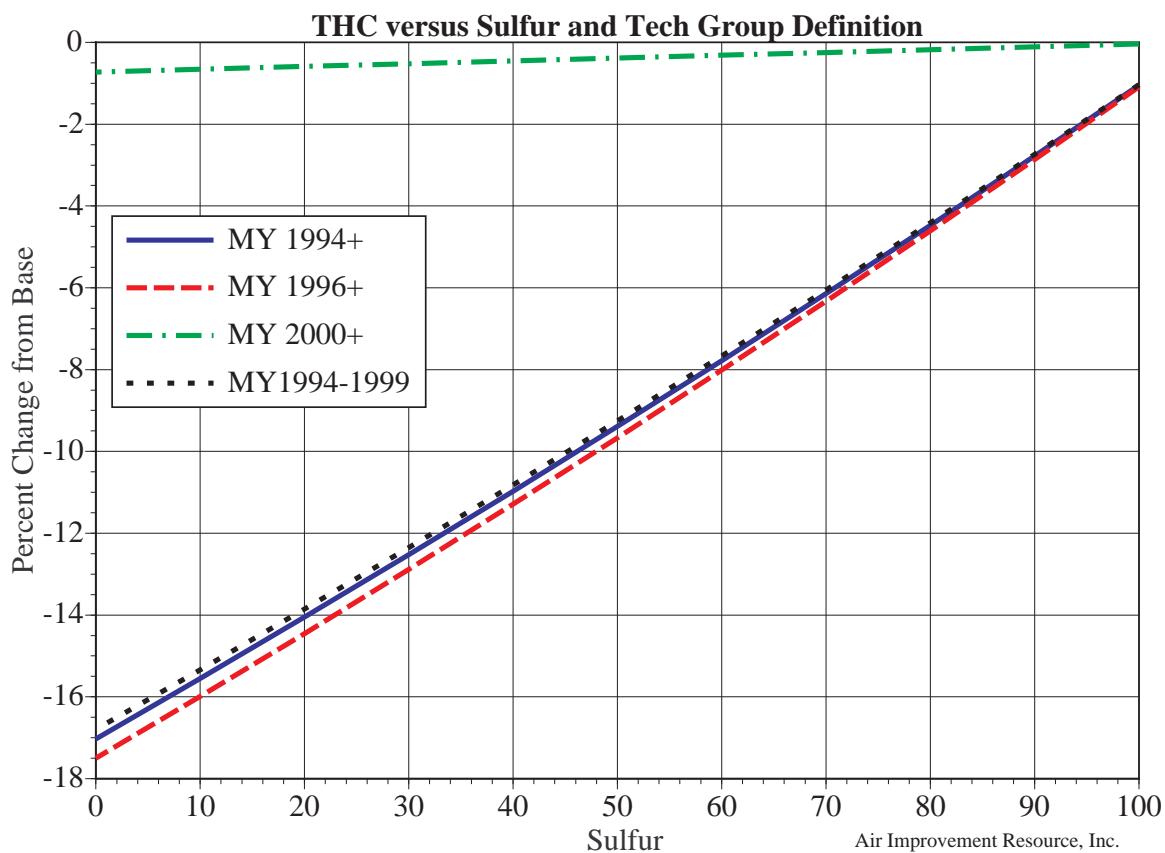
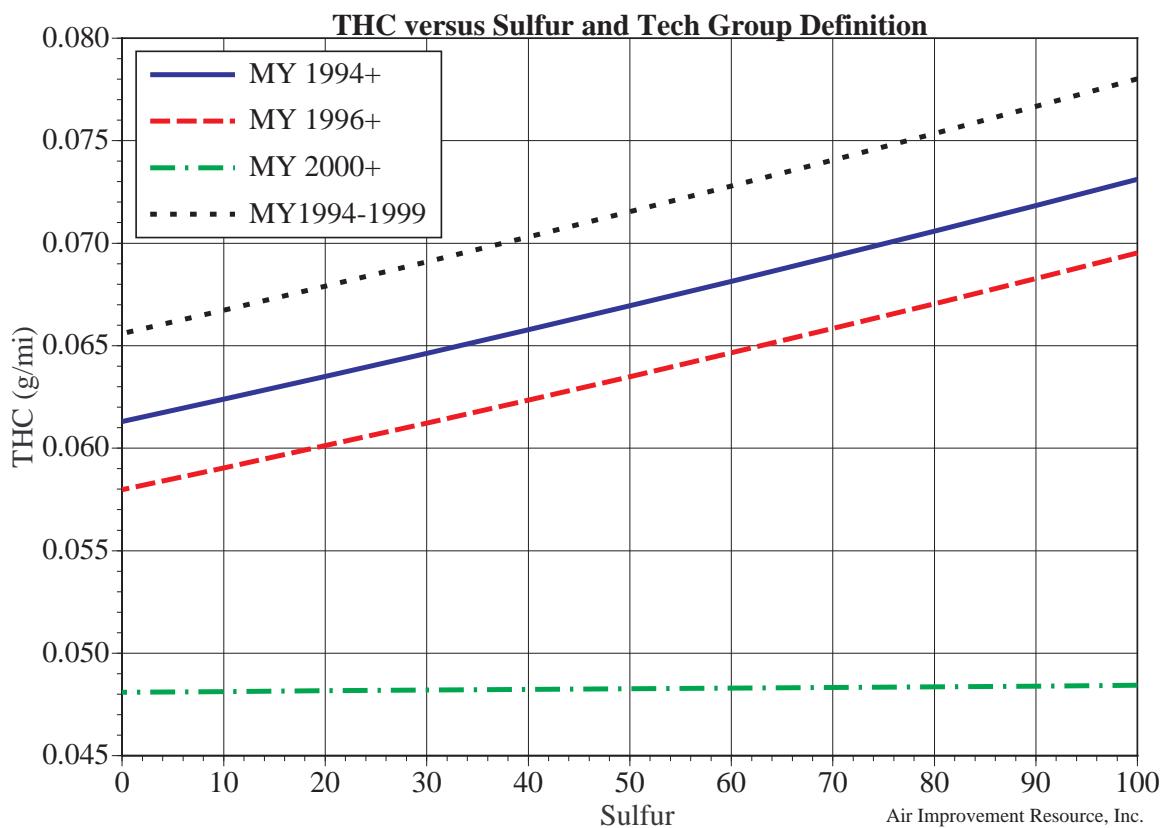
- Divide 1994+ vehicles into different groups
- Fit models through data (natural log of emissions data) similar to the models used by ARB in developing current version of Predictive Model
 - Models are forced to have the same parameters as ARB's 1996+ model
- Plot the predicted changes in emissions, and the predicted percent changes in emissions
- Groups
 - 1994-1999 : 5% TLEV, 80% LEV, 15% ULEV in test data (1325 tests)
 - 2000+: 42% LEV, 48% ULEV, 12% SULEV in test data (516 tests)
- Data Sources in Groups

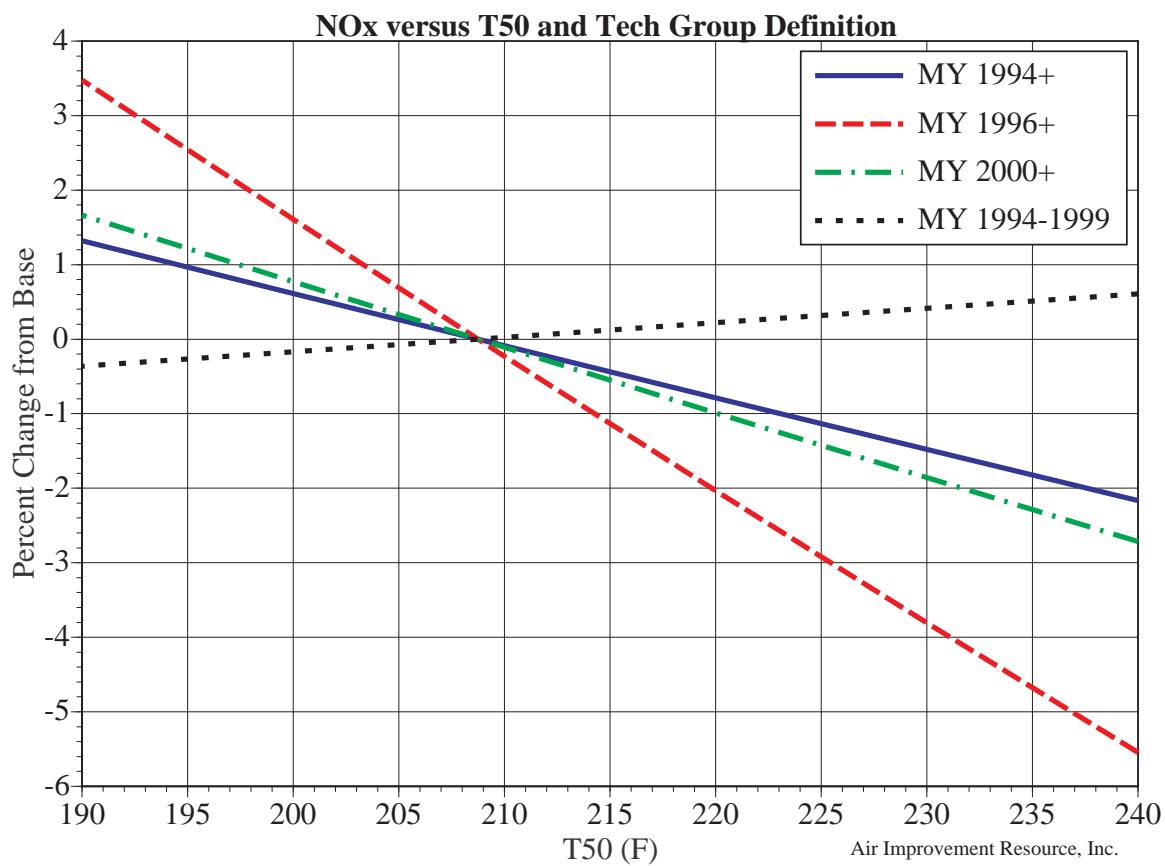
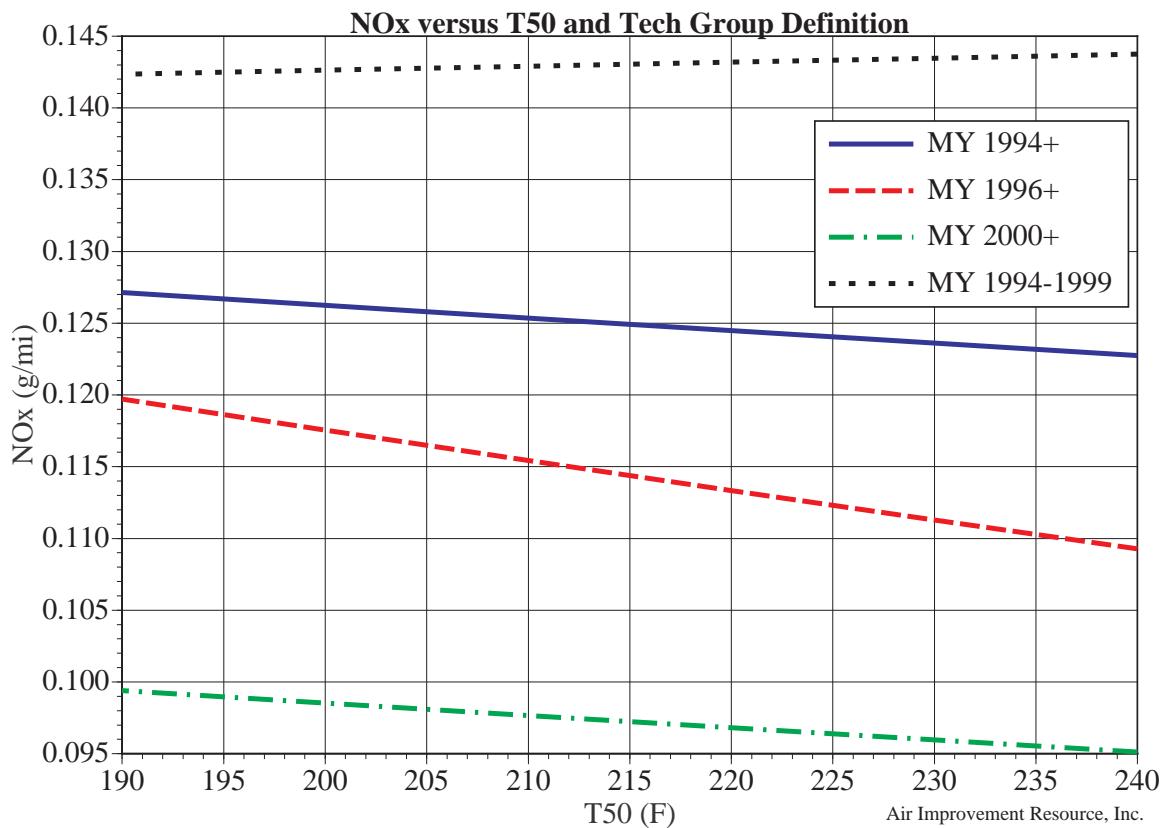
| | |
|------------------|--|
| 1994-1999 | AAMALOSU (1997s, 1999s) AAMSUOXY CRCLOSU (1997s) CRCLOSUO (1997s) EXXONMOBIL (1998, 1999) TOYOTA (pre-2000) |
| 2000+ | CRCE60 (2000, 2001) CRCE67 (2001-2003) |

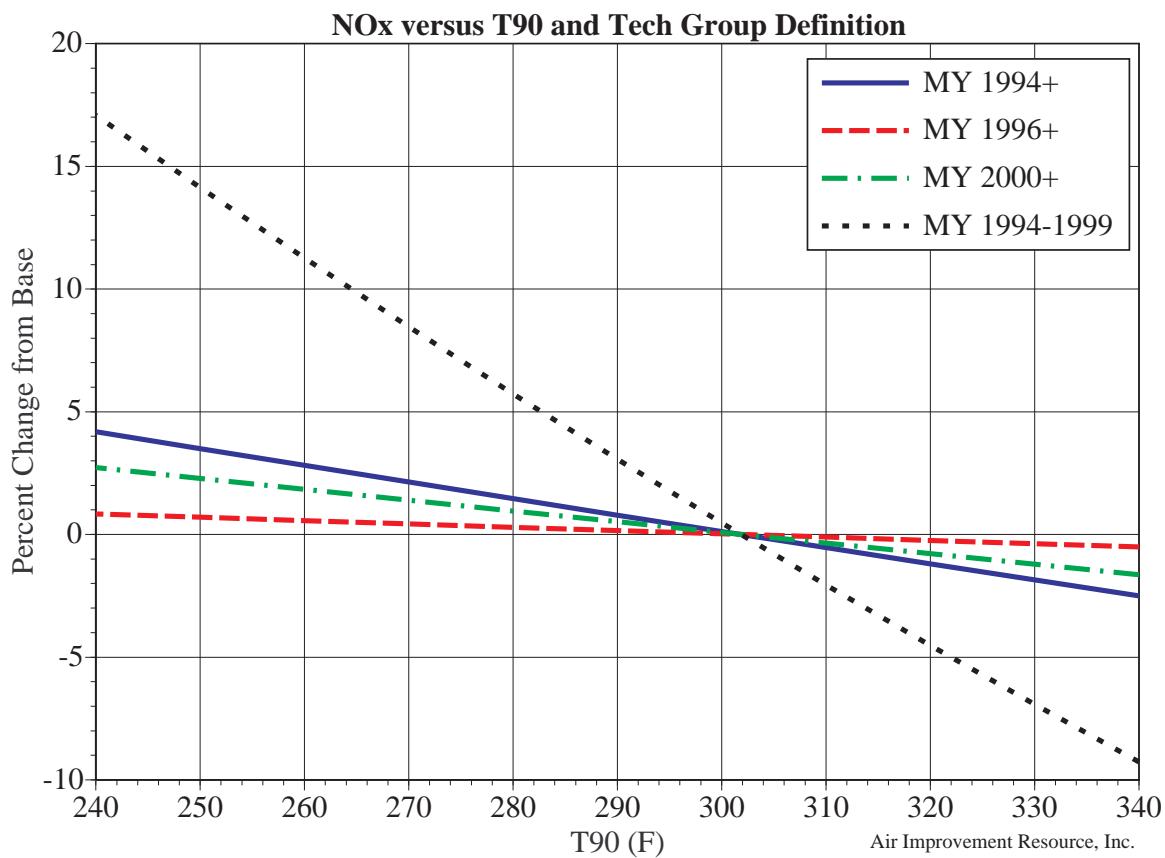
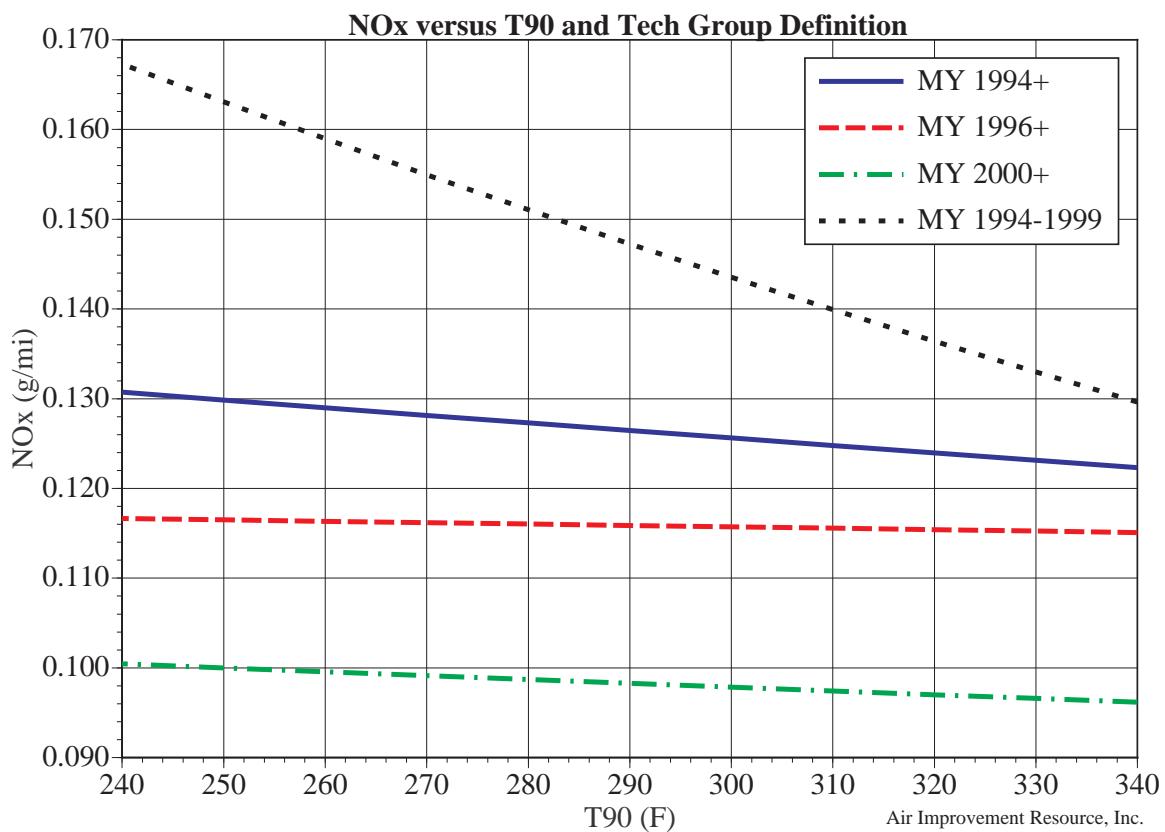


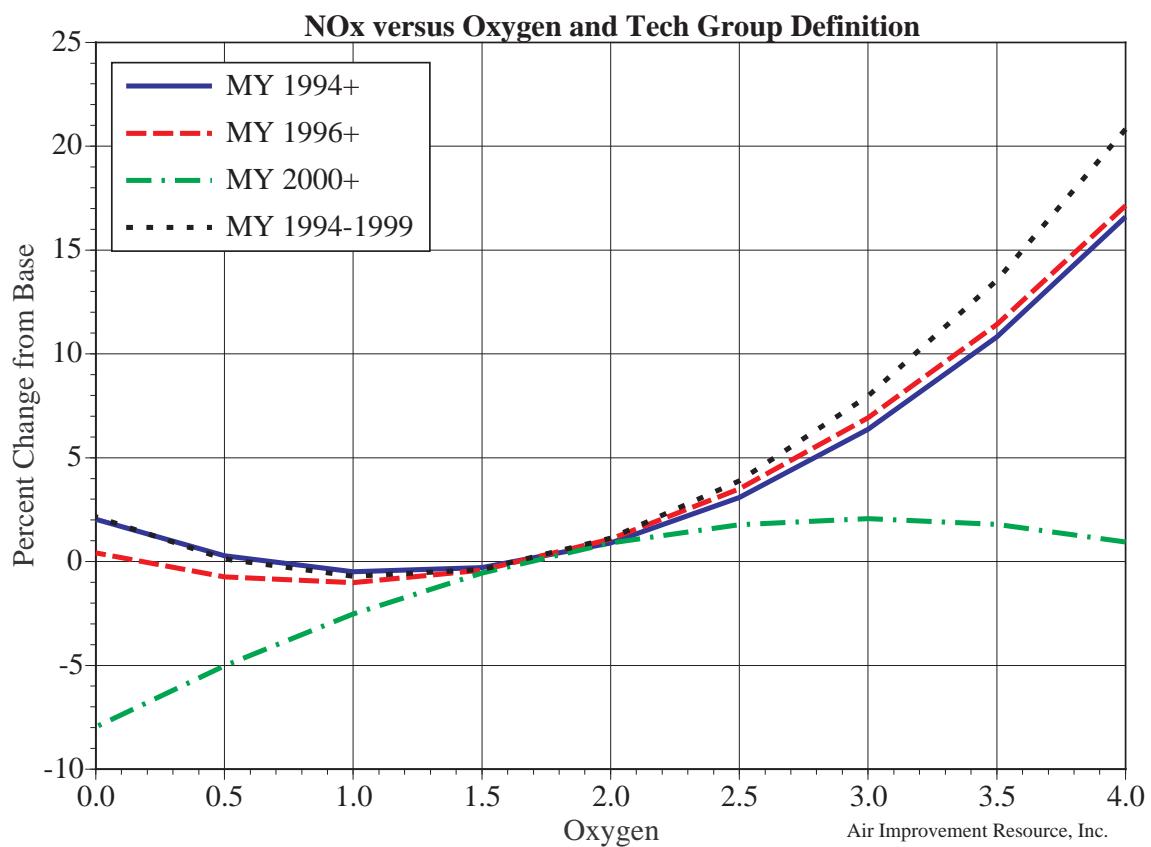
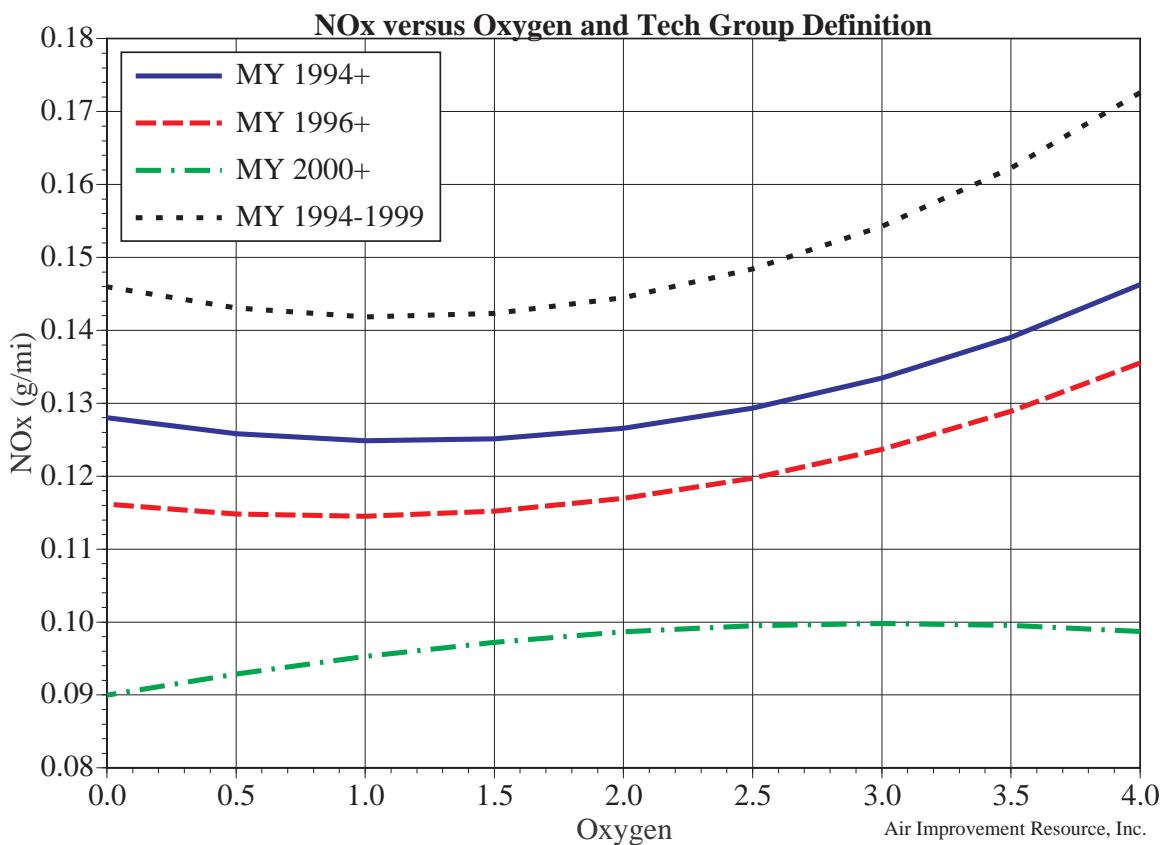


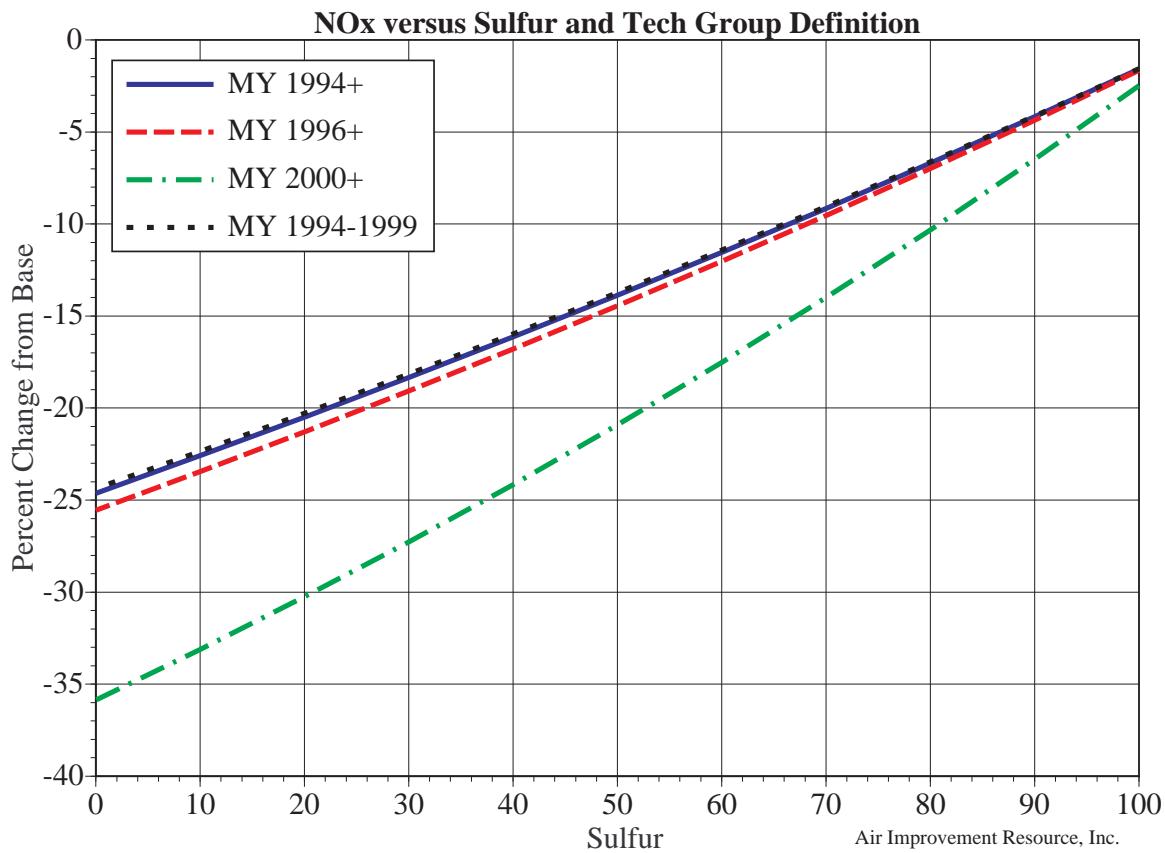
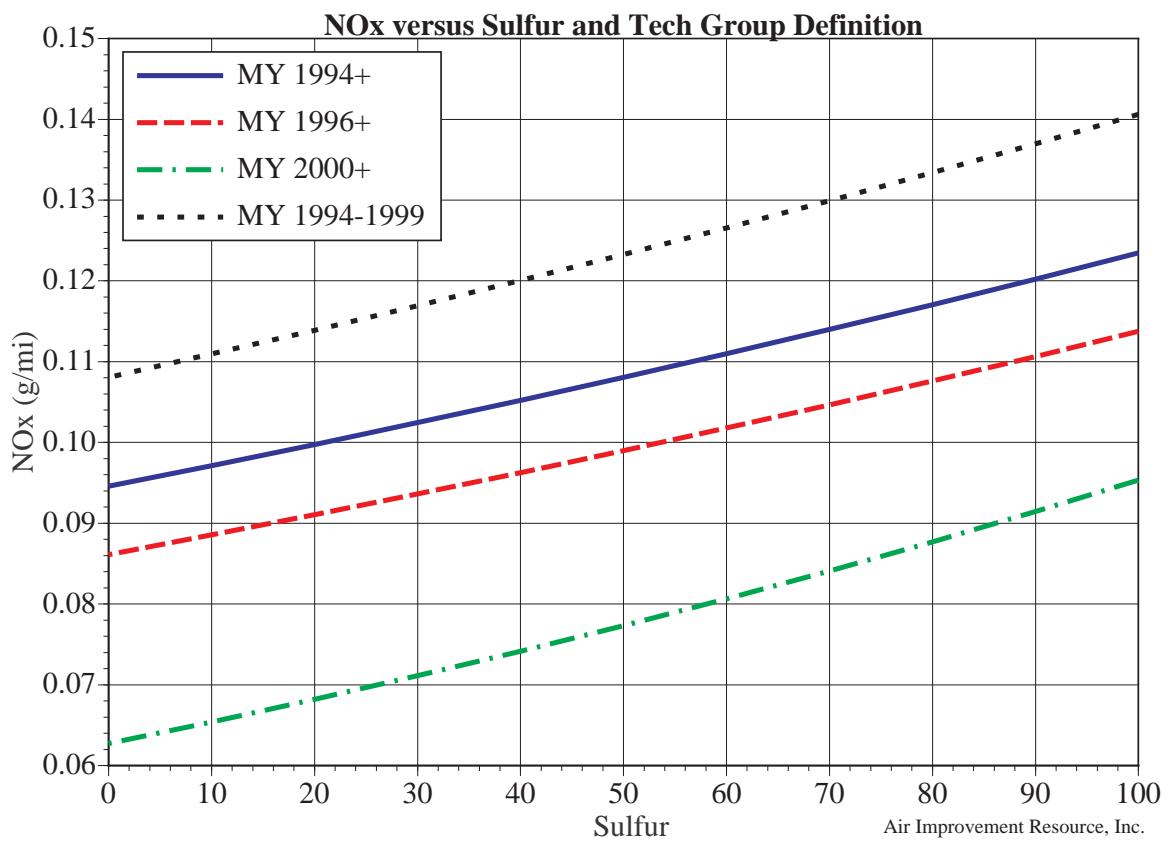












Summary

- **2000+ vehicles appear to have different percent responses than 1994-1999 vehicles for certain properties that have been tested**

THC: T50, T90, oxygen, sulfur

NOx: T90, oxygen, sulfur

But, further work needed on 2000+ model (NOx effect of ETOH)

- **Data suggests the following tech groups:**
 - **Tech 4: 1988-1993**
 - **Tech 5: 1994-1999**
 - **Tech 6: 2000+**
 - **Tech 6 would have to be “extended” from Tech 5**
- **Statistics group has discussed the possibility of the following tech groups**
 - **Tech 4: 1988-1999**
 - **Tech 5: 2000+**
 - **Where only ULEVs and SULEVs would be used to evaluate Tech 5**
- **Preliminary comments on this approach:**
 1. **Lumping LEVs in with Tier 1 and Tier 0 may not be appropriate**
 2. **Not enough ULEVs and SULEVs to develop 2000+**
 - **10,000 tests for Tech 4, ~350 for Tech 5**

| Vehicle Group | Programs | Parameters | Vehicles |
|----------------------|---------------------|--|--|
| 1994-1999 | AOB17&18 | All | 1994-1995 Tier 1s (?) |
| | ARBETOH | Oxy (2-4), R (6.9-7.8), T5 (186-197) | 18-1994, 1995 Tier 1s |
| | AAMLOSU | Sulfur (40-600) | 4-1997s, 17-199s, all LEVs |
| | AAMSUOXY | Sulfur (1-98), Oxy (0-4) | 1-TLEV, 6-LEVs, 2-ULEVs |
| | CRCLOSUL | Sulfur (30-630) | 24-1997s, mostly LEVs |
| | CRCLOSUO | Sulfur (27-148), oxy type? | 24-1997s, mostly LEVs |
| | EXXONMOBIL | Oxy (0-3.5), R (6.4-7.3), T5 (190-203), T9 (270-280) | 1-1998, 4-1999, 3-LEVs, 2-ULEVs |
| 2000+ | CRCE60 | Sulfur (5-144) | 14-2000, 2001 4 LEVs, 6 ULEVs, 2 SULEVs |
| | CRCE67 | Oxy (0-3.8), T5 (190-237), T9 (290-355) | 12-2001-2003 6 LEVs, 5 ULEVs, 1 SULEV |